

(b) If bloodless reduction fails, palmar incision should be used, and another attempt made to reduce the dislocation.

(c) If the bone cannot be reduced, it should be excised.

II. In cases of dislocation of the semilunar combined with dislocation of the proximal portion of the fractured scaphoid;

(a) An attempt at bloodless reduction should be made, and, if successful, the wrist should be kept fixed to obtain union in the scaphoid.

(b) If bloodless reduction fails, and it is necessary to make an incision, it is better to excise both the fragment of the scaphoid and the semilunar than to replace either one or both.

III. If cases of either of the above lesions are seen years after the injury, excision is only indicated for the relief of pain.

CASES OF DISLOCATION OF THE SEMILUNAR BONE.

CASE 1.—E. S.; aged forty years; male; telephone business. At the age of seventeen this patient fell from a high bicycle and sprained his right wrist badly. He had no definite treatment for it at the time. Sixteen years later he fell from a low bicycle and sprained the wrist much more severely. At this time he had massage, but did not wear splints. The wrist continued to give him great pain for a year and a half, and he then consulted Dr. A. T. Cabot, through whose kindness the case is reported. Between 1880 and 1896 the wrist had been stiff, troublesome, and continually subject to sprains. At the time of Dr. Cabot's examination flexion was only about one-half the normal extent and extension about one-eighth; he had one-third the normal amount of lateral motion.

I examined this patient again on June 13, 1904. The wrist was very stiff, with very little adduction and abduction, one-half normal flexion and one-sixth normal extension. A hollow could be felt just below the posterior edge of the lower end of the radius and a prominence under the flexor tendons corresponding to the region of the semilunar bone. There was also a great deal of numbness in the distribution of the median nerve. The patient said that when this numbness first appeared, the fingers supplied by the median nerve were also swollen. This was about six years ago. Since then the pain and numbness have rather increased than diminished, and given him a great deal of annoyance. The

grasp of the fingers was good, but the hand and arm were much atrophied as compared with the right side. There was no swelling or tenderness, but more or less complaint of pain after use. The X-rays taken in 1896 and those taken on June 13, 1904, showed no great change in the intervening period.

There is a fracture of the scaphoid bone in its middle and dislocation of the semilunar forward and towards the ulnar side. There are compensatory changes in the adjacent surface of the radius. The semilunar bone is dislocated forward, with its concave articular surface facing downward and backward, not, as in many other cases, forward. There is evidently a chip of bone in the posterior portion of the joint, probably a part of the semilunar. The os magnum and other wrist bones show a certain amount of atrophy.

CASE 2.—N. H. A., aged forty-two years; mechanic. Fifteen years ago this patient fell twenty feet and struck hand downward with his arm extended. He was seen by Dr. G. W. Mills, of Medford who, under ether, tried in vain to fully reduce the deformity. The hand could be brought into pretty good position, and the projecting carpal bone, the identity of which could not be made out, could be pressed back into fairly good place, but immediately escaped again when pressure was removed. Attempts were made so to apply pressure by pads and apparatus as to hold the bone in place, but this could not be attained, and the effort was presently abandoned on account of the injurious pressure on the skin. It was kept on splints for two months. He was seen in consultation by Dr. A. T. Cabot (through whose kindness the case is reported) in the summer of 1898. At this time the wrist showed a marked deformity with a prominence on the flexor side of the lower end of the ulna.

We examined the patient on June 1, 1904, and found the conditions much the same as that described by Dr. Cabot in 1898. There was the marked silver-fork deformity of the wrist characteristic of Colles fracture, and in addition an unusual prominence, about the size and shape of the semilunar, lying anteriorly to the flexor tendons just above the pisiform bone. There was no pain or tenderness in the wrist, and all motions were limited to about one-third the normal arc. There was some tenderness over the ulna nerve, which could be rolled under the finger as if it were displaced.

The patient refused operation. This is the only case we have seen in which the bone was dislocated to a place entirely anterior to the flexor tendons. The X-ray taken on this date showed a much deformed semilunar bone in the above position, and the place which it formerly occupied in the wrist, empty. There were in addition other joint changes, probably due to fracture of the scaphoid and compensatory hypertrophy of the edges of the articular surfaces. In addition, there were evidences of healed unreduced Colles fracture and fracture of the styloid process of the ulna.

CASE 3.—J. E. B., thirty-six years old, came to the Out-Patient Department of the Massachusetts General Hospital about the first of December, 1897. About eight weeks before he was thrown from a wagon, a distance of five feet, striking on the palm of his right hand, with his wrist sharply extended. He pulled on the hand and felt something slip into place. He had the arm on a splint for two weeks. On December 4 he was admitted to the hospital. At entrance he had very little power in the hand, could not flex the wrist at all, and the fingers very little. The third, fourth, and fifth fingers had more power than the index-finger and thumb. There was marked silver-fork deformity of the wrist, but the styloids were in their normal position. He was in the hospital a week, and, under soaking in very hot water and forced flexion, he improved somewhat. Flexion of the third, fourth, and fifth fingers was then normal. A radiograph of the hand showed a dislocation of the scaphoid bone with no other apparent injury of the bony parts. (Notes by the kindness of Dr. Balch.)

In the light of our present knowledge, this X-ray now shows a dislocation of the semilunar as well as probable dislocation of the proximal fragment of the scaphoid.

CASE 4.—J. W., thirty-one years old, came to the accident room of the Massachusetts General Hospital January 31, 1898. He said a horse had stepped on his right wrist. An examination with the fluoroscope showed what appeared to be a fracture of the styloid process of the ulna. Splints were applied, and he was told to report at the out-patient department. Five days later there was no pain over the ulna, but considerable over the scaphoid. A radiograph showed a fracture of the scaphoid. A sesamoid bone between the ulna and the carpus simulated very closely a fracture

of the styloid process. February 8 he was discharged with only a bandage. There was some limitation of motion of the wrist, but he was improving. I have been unable to trace him since his discharge. (Notes by the kindness of Dr. Balch.)

In the light of our present knowledge, this X-ray shows a dislocation of the semilunar as well as a fracture of the scaphoid. The articular changes indicate that this X-ray was taken some years after the original injury.

CASE 5.—J. C., Jr., aged thirty-four years; male; electrical engineer. On August 24, 1899, this patient was riding a polo pony. Since the pony had a habit of pulling, the patient had taken a double turn of the reins about his left hand. An accident happened in which the pony fell and the rider was thrown and was picked up unconscious. He was seen by a doctor at once, and no injuries were found except a bruised shoulder and an injury of uncertain diagnosis to the left wrist.

X-rays were taken several days later and a fracture of the scaphoid bone of the wrist was found. The hand was kept in splints for about four weeks. When the splints were removed, there was practically no motion of the fingers, and, in spite of judicious massage, it did not recover free motion of the tendons for several months. For instance, in the following November the patient remembers he could not even hold a tennis-ball in his hand. However, the following spring his grip was good enough, so that he could manage his pony in playing polo. Massage, however, was continued pretty regularly for about two years, at the end of which time the extent of motion of the fingers was practically normal, but the wrist still very stiff.

An examination of the patient was made on April 28, 1904. There was decided thickening about the joint of the left wrist, and a prominence corresponding to a dislocated semilunar bone could be felt under the flexor tendons to the ulna side of the median line. There was a slight silver-fork deformity (see photograph), due to the prominence of the os magnum on the dorsum of the wrist, and a hollow in the place which should properly be occupied by the semilunar bone. There is also a slight radial displacement of the whole hand. The aspect of the two hands from the palmar view was strikingly different (see photograph), one having the characteristic shortened appearance seen in other cases of dislocation of the semilunar bone, and

giving the impression that the two hands belong to different people. The left hand was much smaller than the right, and there was marked atrophy of the muscles of the left forearm. The grasp was good but much less strong than that of the right hand, although the extent of the motion of the fingers was normal. There was a slight degree of stiffening of the metacarpophalangeal joint of the thumb. The tenderness about the wrist was very slight, and there was no swelling other than a deep thickening of the whole joint. The patient could flex the wrist for about 25 degrees and extend it for 5 or 10 degrees. Adduction and abduction together could not be carried through an arc of more than 5 degrees. The patient stated that the wrist gave him no trouble in the way of pain or tenderness, but that during the first year after the injury he had a great deal of pain during and after his massage treatments. The wrist does not interfere with him for all ordinary purposes, since he has become accustomed to guarding it and using his right hand for the more severe strains. Awkwardness, weakness, and stiffness are the chief troubles at present. He can play polo as well as ever, and is more apt to feel the weakness of the wrist in pushing than in pulling.

The X-rays taken on September 14, 1899, show a fracture through the middle of the scaphoid, a dislocation of the semilunar bone, and a fracture of the styloid process of the ulna.

The X-rays taken on April 28, 1904, show a transverse fracture of the scaphoid bone in its middle third and an anterior dislocation of the semilunar bone. The proximal fragment of the scaphoid is also dislocated anteriorly. The concave face of the semilunar is turned forward and downward. The ulna styloid has reunited.

CASE 6.—J. A. A., aged twenty-seven years; male; colored; longshoreman. History from Massachusetts General Hospital Records, kindness of Dr. Balch. "Four days ago, while working in a fruit steamer, loading coal, a tub of coal was dropped on him. The coal hit him in the back and the chime of the tub dropped on the radial side of his left wrist just above the root of the thumb. His hand was bent backward and rotated outward, so that the hand was twisted on his wrist, and the little finger was where the thumb ought to have been. He grabbed his hand and put it back into its proper position. It began to swell, and

he came to the hospital, where splints were applied. He then came (the next day?) to the Out-Patient Department, where an X-ray was taken which showed a forward dislocation of the semilunar and scaphoid (?) bones, but no fracture.

"Physical Examination.—Very strong looking negro. Chest and abdomen negative. Left wrist much swollen and very tender. There is a bony prominence in front just below the lower end of the radius." On August 17, 1901, the dislocation was reduced under ether by Dr. F. G. Balch. The reduction was accomplished by extension, followed by flexion with pressure over the dislocated bones. The patient had considerable pain the first twenty-four hours after the reduction, but the wrist was quite comfortable on the second day. On the 20th an X-ray showed the bones of the wrist to be in almost perfect position, the only departure from the normal being that the semilunar was a little anterior to its normal position. The patient was discharged to the Out-Patient Department on this date, and we have no further notes on his case until an examination by E. A. C. on August 11, 1904. The following additional facts were obtained.

The blow from the tub of coal was a glancing blow, but did not catch his hand against the floor or other object. It struck his back and arm at the same time and, as he describes, "twisted" it. He insists that when he looked at his hand, the thumb was where the little finger should be, and that he immediately twisted it back into place. After leaving the hospital he was not able to go to work for three months, but at about this time began to do heavy labor again, and does not remember that the wrist bothered him for more than a few weeks after beginning work.

Examination on August 11, 1904, shows that the wrist is almost perfectly normal. There is no swelling or alteration of the bony landmarks, and only the slightest possible tenderness and pain in forced flexion. The motions as a whole are normal, and the patient states that he is not conscious of having a lame wrist at all.

CASE 7.—J. K., aged twenty-seven years; male. This patient was brought into the hospital on June 28, 1901, in an unconscious condition, having fallen out of a second-story window. His record states that at this time the left wrist was swollen and crepitus was obtained among the carpal bones. He also had other injuries. He was discharged from the hospital on July 12.

Shortly before, the accompanying X-rays were taken of his wrist.

His record does not state the treatment to the wrist which he received at the hospital, but we assume that the dislocation was not reduced. It is possible that the patient refused further treatment.

This case is introduced in this series merely to serve as an instance of how such injuries may be overlooked, even now that we have the X-rays. The X-ray shows a typical anterior dislocation of the semilunar with fracture of the scaphoid and dislocation of the proximal fragment.

CASE 8.—J. B. R., aged thirty-five years; male; plumber. On August 15, 1902, he fell twenty-five feet, and sustained a compound dislocation of the left wrist. He was taken at once to the Massachusetts General Hospital, and was etherized and operated on by Dr. Torbert, the senior House Officer. An X-ray at the time showed dislocation of the hand and distal carpal row of bones backward, as well as a transverse fracture of the middle portion of the scaphoid. The semilunar with its convex articular surface still in contact with the radius was thrown forward. Dr. Torbert, under ether, removed the proximal fragment of the scaphoid and endeavored to reduce the dislocation. The hand was put in splints and the patient sent to the ward. X-rays taken on the following day showed that the semilunar bone was still dislocated forward. The convex surface, however, seemed to be still in contact with the radius, and the concave surface faced downward instead of forward, as is usual in dislocations of the semilunar. There also appeared another fragment of the bone on the dorsum of the wrist which was probably a portion of the triquetrum or semilunar. Hoping to reduce the dislocation of the semilunar, I (E. A. C.) gave the patient ether again, and endeavored to reduce the bone without opening the previous wound. I failed to do this, however, and a few days later etherized him again, and, holding apart the flexor tendons with retractors, I managed to reduce the semilunar perfectly by hyperextension followed by hyperflexion. The patient went to work ten weeks after discharge from the hospital, but has had continued soreness in the wrist, although the strength is excellent. An examination on March 5, 1904, showed that there was still decided tenderness and swelling over the scaphoid, and very slight motion in the wrist-joint itself. The limitation seemed

to be more due to spasm than to any ankylosis. The hand could be moved through an arc of about 40 degrees only. The patient said that he could use it for any kind of a straight lift, and that there was tenderness in pushing or twisting, but that he thought it was improving continually. It seemed to me that the motion was not quite as free as it was about six months after the injury. In spite of the lack of complete flexion and extension, the result was very good considering the great severity of the original lesion. The X-ray showed very clearly all the lesions described above.

CASE 9.—P. F., aged forty-five years; male; hack-driver. On January 12, 1903, this patient stepped into a manure hole and fell forward, striking on the floor with his extended hand. He consulted a doctor at once; the wrist was bandaged, and he was given liniment to rub on it. The diagnosis was a bad sprain. On February 9, just four weeks after the injury, the patient came under my (E. A. C.) care in the Out-Patient Department of the Massachusetts General Hospital. His right hand and wrist were practically useless. The wrist appeared shorter than the left, so that the hands, from the palmar view, appeared to belong to different people. There was a tumor at the flexure of the wrist-joint on the palmar side about opposite the rim of the lower end of the radius, over which the flexor tendons pass. The fingers were held in half flexion, and could scarcely be moved by the patient or the examiner without causing great pain in the wrist-joint. There was a general tenderness and anteroposterior thickening of the wrist. The X-ray showed an anterior displacement of the semilunar bone with the concave articular surface directed forward instead of downward.

I made three attempts under ether, on the 9th, 12th, and 14th of February, to reduce and hold the bone. I succeeded only on the third attempt, although at the other attempts it felt as if the bone had been put in place. It is probable that, although I had succeeded at first in reducing the bone, it had slipped out during the application of the splints. On the third occasion I reduced it, and put it in a plaster-of-Paris bandage in a position of half flexion. The patient experienced immediate relief in the feeling of the wrist after the reduction, in spite of all the manipulation which had necessarily been given to the joint. The convalescence was slow but uneventful, and in the course of six weeks the patient was able to use his wrist to a certain extent.

I examined the patient again on January 29, 1904. The result was wonderfully good. There was the slightest possible limitation in extension; adduction, abduction, and flexion were normal. There was no change in the bony landmarks, and no pain or tenderness unless very forcible extension was made. It did not interfere with his work at all.

The X-ray at this time showed that the semilunar was in very nearly normal position, though possibly somewhat further forward than the normal site, as if the posterior attachment to the ligaments had not formed as high up as its former place.

In the original X-ray in this case a fracture of the scaphoid, as well as dislocation of the semilunar, was shown; but on re-examining the plates the diagnosis of fracture of the scaphoid cannot be positively asserted. The X-ray on January 29, 1904, shows that, if there was any fracture of the scaphoid, it has left no sign in the bone, which appears of normal shape.

CASE 10.—J. A. F., aged thirty-four years; male; laborer in a woollen mill. This patient came under observation on May 21, 1903. About six weeks (?) before he had fallen down-stairs and his hand had been turned under him. His local physician applied a splint at the time, and this was retained for several weeks. As the wrist did not improve, he consulted another doctor, who also considered the lesion a sprain and applied splints. No improvement followed, so he came from his home in Lawrence to the Massachusetts General Hospital. At the time of my examination, his right hand was practically useless. The fingers were stiffened in a position of half flexion, and could neither be extended nor flexed actively or passively without causing decided pain. The aspect of the hands from the palmar view offered a striking contrast, so great as to appear to be hands of different individuals. There was no great swelling, but the wrist of the injured side appeared distinctly shorter than that of the uninjured. There was a slight prominence under the flexor tendons opposite the lower end of the radius resembling a silver-fork deformity. The wrist was tender, especially on the palmar side. The relations of the styloid processes were normal. There was only a few degrees of motion in the wrist-joint.

The X-ray showed clearly a dislocation of the semilunar bone forward, and a fracture of the styloid process of the ulna. There also existed a line in the lower end of the radius which seemed

to indicate a transverse fissure through the line usually broken in Colles fracture. Having reduced already two dislocations of this kind by the method of extreme flexion followed by extreme extension, I gave this patient ether, and endeavored to reduce the dislocated semilunar in this way; and, although the bone was apparently reduced, it was not held in the splints, and the X-ray, after the supposed reduction, showed that the bone was still dislocated. During the next week I gave him ether again, and endeavored unsuccessfully to reduce and hold the bone; but on the third occasion I felt justified in cutting down on the palmar aspect of the semilunar, and was able, by catching the bone with a tenaculum, to reduce it perfectly. The relief was immediate and convalescence uninterrupted. In the course of a few months the fingers had recovered most of their flexibility, and the wrist-joint itself could be moved through a considerable arc. He went to work two weeks after he left the hospital, *i.e.* (twenty-five days after operation), and has worked every day since.

I examined the patient again on January 30, 1904. At this time he had no tenderness and no swelling, but the wrist was decidedly stiff, the normal arcs of flexion and extension being limited to about one-half and the lateral motions to about one-third of the normal. His grasp was good, although slightly limited in taking hold of a small object, for instance, a lead-pencil. His wrist does not interfere with his work, but he feels as though it would if he had heavy lifting. It gives him no pain and he is perfectly satisfied with it.

The X-ray at this date shows that the semilunar, while it is back in place, is somewhat further forward than its normal position, indicating that its posterior edge is not attached to the ligaments as far backward as formerly.

The X-rays in May, 1903, showed that the semilunar was dislocated forward in such a manner that the concave surface, which should face downward to receive the os magnum, faced forward under the flexor tendons. The os magnum therefore fell in behind it and approached the articular surface of the radius.

CASE 11.—A. C., aged twenty-three years; male; plasterer. In September, 1903, he fell off a staging sixteen feet high. He had hold of a ladder at the time with his right hand, and the ladder fell with him, so that in some way his wrist was twisted

through the ladder. He does not know exactly how he fell, as he was unconscious a moment. After coming to, he attempted to go to work again, and tried to work during the day, but his wrist pained him extremely. He could not sleep that night; his wrist was much swollen and tender; he could not move it, but it was not black and blue. The next day he went to the Boston City Hospital, and was told that it was a bad sprain. It was put in splints for one week. He then went to his home in Lowell, and came under the charge of another doctor, who said the splint had been on too long, and had the wrist massaged.

At the end of the seventh week, as the wrist did not improve, he came to the Massachusetts General Hospital, where X-rays were taken, showing that the scaphoid bone was fractured at the middle, and the proximal fragment together with the semilunar bone were dislocated forward. He was referred from the Out-Patient Department to the ward by Dr. C. A. Porter, and later in the hospital, November 18, 1903, was operated upon by Dr. R. B. Greenough, who excised the proximal fragment of the scaphoid and the dislocated semilunar through a two-and-a-half-inch incision on the palmar side. Twelve days later the patient was discharged, with directions for bandaging, using hot and cold water and manipulating the wrist.

Through the kindness of Dr. R. B. Greenough, I was able to examine this patient April 16, 1904. There was no tenderness of his wrist, no swelling; some thickening through the region formerly occupied by the scaphoid and semilunar. The wrist appeared shortened as compared to the other, although the appearance was not so strikingly different between the two hands as has been seen in other cases where the bone was still dislocated. The arc of flexion was a good half of the normal, and that of extension somewhat over half. Adduction and abduction, however, were limited together to an arc of about 10 degrees. Forced motions were not as painful in this patient as in many cases of simple fracture of the scaphoid. He said that the wrist was still improving, and, though it "weakened him" and was sore and lame after hard work, he was yet able to do his work as a plasterer, although it called for continual use of the wrist-joint. He had no pain, but soreness after use. He thought cold weather stiffened it somewhat. It seems to me that this wrist would have been a very serviceable one for almost any occupation except that

of a plasterer. The X-ray shows that the interspace left by the removal of the semilunar and fragment of the scaphoid has become much diminished in size owing to the approximation of the remaining bones to the radius.

Microscopical examination of the fragment of the scaphoid which was removed shows that there is little evidence of a process of repair, although the operation was not done until seven weeks after the injury. A very thin layer of fibrous tissue had formed over the raw surface of the broken trabeculæ.

CASE 12.—J. T. M.; shoemaker. History from Records of Massachusetts General Hospital. Kindness of Dr. C. A. Porter, July 30, 1901. One year ago he was thrown down with his hand flexed under him, thus breaking his wrist. He was treated in the Lynn Hospital. Ever since his wrist has been stiff, weak, and painful. Lately he has had burning sensations in the palm of his hand and middle fingers. Physical examination. Small-sized well-nourished man. Chest and abdomen negative. Left elbow shows old dislocation outward of both bones, with, however, good motion and strength. Right wrist is very stiff and painful, especially over a lump on flexor side over end of radius. This lump, the size of half a walnut, is hard, immovable, and very tender. Sensation in palm and fingers unimpaired. X-ray shows fracture of scaphoid and dislocation of semilunar and old fracture of radius.

Operation, August 5. C. A. P. Ether; tourniquet. An incision three inches long over the prominence on the anterior surface of wrist in about the middle line. The dissection was carried down and the median nerve identified and retracted outward; the tendons of the superficial and deep flexors were separated and retracted inward and outward, thus exposing the front of the carpus, where the semilunar bone was seen projecting forward. The ligaments about this were divided and the bone pried out from its place. Bleeding points tied with catgut. The tendon sheath was sutured with three catgut sutures, and the skin loosely approximated with silkworm gut. Protective rubber drain and dressing with anterior splint were applied.

August 6. Good recovery from ether. Patient complained of no pain and seems very comfortable. August 7. Patient says that there is the same kind of pain in hand that there was before operation. August 12. Stitches removed. Wound clean. Tem-

perature normal. Still complains of pain. August 13. Discharged, relieved, to Out-Patient Department.

Unfortunately, we have no further record of this case, because in August, 1904, when we endeavored to look him up and examine him, we found that only the week before he had been killed in an accident. However, his niece was seen by Dr. Chase, and it was learned that, though the wrist had continued stiff after the operation, he had not complained of pain from it. He had been able to do "lasting" in a shoe-shop, but could not do heavy work.

PART III.

CARPAL INJURIES IN GENERAL.

Résumé of Literature.—In 1834, Bouchet reported fracture of the carpal bones on a cadaver by hyperflexion and extension; the oldest clinical case in literature of fracture of a carpal bone is that of the scaphoid by Janjavay in 1846. Since that time several writers have reported carpal injuries, but the literature has a great poverty of important detail. Many of the early writers remark on the rarity of fracture of the carpal bones. This view we now consider to have changed in the light of more accurate and detailed methods of diagnosis, a growing interest to report cases, and increased facilities for keeping in touch with literature.

Carpal injuries have been classified a number of times by different writers, who have tabulated the total number of cases of injury to each of the carpal bones, enumerating the kind of injury, and the names of authors who report cases. Accumulation of this data can be found in articles by Ross and Wilbert and by William Hessert, 1903, who have tabulated the history of initial injury with reference to origin by fall, blow or crush, giving the number of cases under each heading, also the number of males and females suffering injury to carpal bones, the frequency of injury to right or left wrist, and the relative number of cases both acute and chronic in each decade of life.

These we have verified with additions to date (1905), and while it is unnecessary to devote space in this article to a summary of these figures, we will repeat in a few words the important points to be learned from them.

Injury in males very greatly predominates over females in the proportion of ten to one; injury to the right wrist predominates over the left by a much smaller margin; the decade during which the injury has most frequently occurred has been between twenty-five and thirty-five years.

The causes of carpal injuries have been trauma, either direct or indirect, more frequently the latter. These have been due to falls from varying heights, the force exerted having usually been forcible extension or flexion, occasionally with rotation and abduction.

Carpal injuries have occurred combined with injuries to other bones, fractures with dislocations, fractures of radial or ulna styloid, Colles fracture, fracture of metacarpal, especially that of the thumb, or with either bone of the forearm, especially the radius. No carpal bones have been exempt from injury, though there is a great variation in frequency, which is represented by the following order: Scaphoid, semilunar, pisiform, os magnum, trapezium, trapezoid, unctiform, and euneiform.

Diagnosis and Treatment of Carpal Injuries.—Throughout the early literature, carpal injuries were spoken of under the heading "carpus," the diagnosis seldom specified the exact location of the injury, but spoke of fracture and dislocation in general.

In a very large majority of the old reports of cases of fracture of a carpal bone crepitus was looked upon as a cardinal symptom; when other details were not important enough to mention, crepitus was noted, and remained as a special observation until after the X-ray came into general use, when its observation became much less frequent.

Ricard said in 1890, "clinically, one might say, simple fractures of the carpus do not exist. The only sign that has any value whatever and permits of affirmation of fracture is

crepitus." Carl Beck, in his treatise on fractures (1900), included fractures of the scaphoid under the general heading "carpus" without other mention; abnormal mobility and crepitus absent; pain and functional disturbance the main things. Stimson, in 1900, hinged his diagnosis of simple fracture of the carpal bones on the presence of crepitus. Swelling and tenderness are frequently referred to, but not as a means of localization. Ecchymosis has not been reported in any case, except in one instance of its presence on the thena and hyperthena eminences resulting from contusions of the soft parts. Painful motion or loss of function have been associated with several reports, but only as existing conditions, and not as means of diagnostic localization. Tumor has been a common observation accurately, localized, but frequently misinterpreted before the X-ray era.

The diagnosis of carpal fractures before the use of X-rays was based upon crepitus and tumor in case a bone or fragment was displaced; in the absence of these signs, sprains and fracture of the lower end of the radius were frequent errors. *In the absence of crepitus and tumor*, we believe, in no recorded case previous to the use of X-ray has a correct diagnosis been made of a simple fracture of a carpal bone, which is not the condition of recent date, for we have in a number of cases made a diagnosis of simple fracture of the scaphoid in both old and recent cases from the clinical history and symptoms, previous to the condition being confirmed by an X-ray. Blau also makes the same statement. Hoffiger (1901) wrote "in fresh injuries, palpation, if carefully done, usually succeeds in establishing a diagnosis relying on the feeling of crepitus." He considered the diagnosis of carpal injuries in greater detail than previous writers, and made the observation of tenderness on pressure over the region of the scaphoid, and stated that shortening of the measurement from the radial styloid to the end of the second metacarpal from .5 to 1.5 centimetres was a suggestive factor in the diagnosis. Hoffiger also remarked that fracture of the scaphoid is frequently accompanied with bursitis of the tendon sheaths about the wrist. We are unable

to confirm Hofliger's measurements from the radial styloid because it did not occur to us to make this observation on our cases. We have already spoken of the fact that we have not found bursitis of the tendon sheaths in cases of carpal injury, but consider it more symptomatic of fracture or fissure of the lower end of the radius.

Treatment of carpal fractures may be briefly summarized as it has been viewed by different observers. In a practical treatise by Frank H. Hamilton on "Fractures and Dislocations," 1875, half a page is devoted to carpal bones; the few observed cases were compound and complicated, resulting in complete loss of function or in considerable disability. In no case was treatment directed to the injured carpal bone. He remarks that simple fractures do not need surgical interference, and that they unite without much displacement or maiming, except in some degree of ankylosis.

In 1890, Ricard described fracture of a carpal bone as having little gravity in the way of complications of the synovial articulations and tendons, and suggested immobilization for fifteen days in splints followed by massage. In 1900, Beck advised a palmar wire splint for carpal injuries, massage after ten days, then active motion. Stimson advocated immobilization for two or three weeks, and in compound cases to remove the bone. Scudder, in 1900, considered the possibility of fracture of the scaphoid being mistaken for rheumatism, painful, weak, and sprained wrist, and noted the persistence of painful limitation of extension after carpal fracture, and advocated the use of splints for one week, followed by massage.

In compound fractures with dislocation of the whole or a fragment of the bone, the treatment has been excision and drainage of the wound. Friederich advised for carpal fractures and dislocations manipulation and reposition if possible; immobilization with splints and high position followed by massage and passive motion. Blau favors immobilization of the wrist for four weeks, and considers the course of recovery following mechanical treatment as by no means smooth, but will be frequently interrupted from time to time by exacerbations.

Bardenheuer, in fresh cases of fracture of the scaphoid, advised splints for eight days, followed by four days of light movement, and eight days of massage and gymnastics. Hofliger would modify this by doubling the time of use of the fixation, and considers that when the fragments are in apposition, recovery always follows with union of the bones. *In old cases* he advised resection of the bones, which usually brings about good results. In operation he considers the Esmarch bandage contraindicated, as it predisposes to late hæmorrhage. Short dorsoradial incision; the only tendon in danger of injury is the extensor longus pollicis. After removal of the bone, the wound should be examined and small retained spicules removed by scissors. The dorsal wound should be closed and drainage obtained through an anterior incision, along the tendon of the flexor carpi radialis.

Kaufman was the first to remove the whole scaphoid. Pagenstecher, in an old case of fracture of the scaphoid, first removed the proximal fragment, but later in the operation decided to remove the whole bone, because he did not wish to leave the fractured surface, and because he thought better motion would result if there was no protruding angle on the distal fragment.

Prognosis of fracture of the scaphoid is considered by Hofliger as uncertain because there is an intracapsular fracture. Quervain reports prognosis without operation as very unfavorable, and refers to a case reported by Lembke of a patient with a fractured scaphoid, seen twenty-four years after the injury, whose articulation was entirely stiff. He says that removal of the distal fragment of the scaphoid has no advantage because all trouble is caused by the proximal fragment. With partial dislocation of the semilunar and fracture of the scaphoid, use the dorsal incision for removal of both luna and scaphoid fragment. With complete dislocation of semilunar and fracture of scaphoid, it is easier to work through an anterior incision between the flexor carpi radialis and the median nerve. Quervain favors the use of the Esmarch bandage. Prognosis with operation, *i.e.*, excision of semilunar

and fragment of scaphoid, gives favorable result. The removal of both semilunar and scaphoid may give good functional result. After-treatment—splints, passive and active motion, and massage.

Treatment of Carpal Dislocation.—In 1904, Scudder, after speaking in a few words of mistaken diagnosis, the use of the X-ray, and the possibility of the presence of a bipartite scaphoid, outlines treatment for acute cases of dislocation as follows: immediate reduction with manipulation under anæsthetic, immobilization, passive motion at the end of two weeks.

Sulzberger outlines treatment of dislocation in general: manipulation and reduction; splints eight to ten days, massage, exercises. He states that the symptoms of fresh dislocation are clear. Where results are unsatisfactory, he considers it due to a delay in reduction, considering that reduction should succeed always in fresh cases of carpal dislocation either with or without an incision, and in these cases the functional results are always favorable.

Hofliger states that in cases of dislocation of the semilunar, the anterior position of which is the most frequent, reduction is usually not successful; but when successful soon after injury, the results are satisfactory as reported by Taaffe. In old cases or in recent ones where reduction is not obtained, the bone should be excised, which is stated as being followed by perfect functional result. No Esmarch should be used; incision over the flexor carpi radialis, four centimetres; draw the tendon to the radial side, excise, suture, bandage, exercise as soon as possible.

Friedreich, after discussing the general subject of carpal dislocations, describes the treatment as follows: "For all the above dislocations, reduction should be attempted by maximal extension for the forward variety, extreme flexion for the backward variety, followed by pressure upon the bone and gradual return of the wrist to its normal position."

Other authors have reported a number of cases of dislocation which were treated by manipulation, and attempts at reduction which, if not successful, were followed by excision of

the dislocated bones. After diagnosis with the X-ray of dislocation, only one recorded case has been found of reduction of the dislocation by an open incision when ordinary reduction was found impossible.

RÉSUMÉ OF CASES OF INJURY TO CARPAL BONES

(IN WHICH RESULTS WERE MENTIONED REPORTED PREVIOUS TO 1895).

The cases previous to the use of the X-ray (1895) are characterized by the absence of definite detail of clinical condition and of recorded results except in a few cases which are worth considering.

ELKINGTON, cf. COOPER, 1842, a posterior (?) luxation of the scaphoid and fracture of the lower end of the radius in a man sixty years of age, resulted in the reduction of the scaphoid by pressure and union of the fracture. At the end of six weeks there was limitation of the motion of the wrist, and diminished power to grasp firmly. Another similar case recorded an excellent result.

TAAFFE, 1869, reports a reduction of an anterior dislocation of the semilunar ten minutes after occurrence, resulting in no impairment of the motions of the wrist.

MORRIS, 1883, in a case of anterior dislocation of the scaphoid and os magnum which was reduced, reports the treatment; splints, passive motion in a few days continued until splints were removed at the end of four weeks, then gentle active and passive motion. Result after three months, fair motion of carpus.

CAMERON, 1884, in case of an anterior dislocation of the semilunar in a man thirty-two years of age, after excision, reports a good useful hand and wrist without reference to time.

STEWART, 1888, reports an immediate reduction of an anterior dislocated scaphoid: result five months later, "good motion with inconvenience."

MALGAIGNE reported an anterior luxation of the semilunar followed by excision, recording a good result two months later.

RÉSUMÉ OF CASES SINCE 1895. CASES OF FRACTURE OF THE CARPAL SCAPHOID.

KAUFMAN.—Male; thirty-nine years. Left wrist was treated for long time with splints. Condition one year later, pain and limitation of motion. *Diagnosis*, fractured scaphoid. *Operation*, anæsthesia. No Esmarch. Dorsal incision, six centimetres long. Strong adduction exposed the scaphoid and the outer fragment was removed. One year after operation, active motion without pain; a little swelling on dorsum in region of

scaphoid. Flexion and extension each 45 degrees. Adduction and abduction each 20 degrees.

HOFLIGER.—Clinic of Dr. Kaufman.—Male; twenty-three years. Fell on left wrist, August, 1898. *Diagnosis*, dislocation of the hand and fracture of the radius. Had been treated for three weeks in splints followed by electricity and massage. Seen in February, 1899; there was weakness of the hand, no motion in extension. Flexion, 20 degrees. Slight abduction and adduction. Pronation and supination normal; tenderness in the region of the scaphoid; pain on motion. X-ray showed a fractured scaphoid in three pieces. *Operation*, Dr. Kaufman. Anæsthesia, tourniquet, dorsoradial incision eight centimetres long, scaphoid removed, wound drained and sutured. Slight sepsis, small bony spicules removed, final healing. Discharged December, 1899. Result (time not stated), no motion in extension, muscles relaxed and atrophied, but react to electrical stimulation. No pain on pressure over wrist.

PAGENSTECKER.—Male; thirty years; June, 1902. Fell on outstretched hand. Said to have dislocated his wrist. Had to stop work. In March, 1903, *diagnosis*, fracture of the scaphoid. *Operation*, incision between extensor longus pollicis and extensor brevis pollicis. Capsule opened and fragments found connected by ligaments, both fractured surfaces smooth and covered with cartilage. (?) Whole scaphoid removed, splint and massage. Muscular power of arm weakened for a long time, especially pronation. At work in June, 1903.

STIMSON.—*First Diagnosis*, fracture of scaphoid. Male; forty-six years. Movable bony prominence felt under the skin in the middle of the anterior surface of the right wrist. *Second Diagnosis*, dislocation of the semilunar bone, which he proceeded to excise before developing the X-ray, which was previously taken. Incision showed it to be the proximal half of the scaphoid, which he removed. Result, one month later the patient could make light use of his wrist with fair mobility.

CASES OF DISLOCATION OF THE SCAPHOID AND SEMILUNAR BONES.

HESSERT.—Male; twenty-five years; June, 1902. *Diagnosis* made one month after injury, anterior dislocation of scaphoid and semilunar. *Treatment* during the first month was splints; disability of hand and wrist with painful movements followed. Reduction impossible. *Operation*, both scaphoid and semilunar excised. Result in March, 1903,—eight months after operation,—considerable improvement, yet far from perfect. The hand was useless before operation, now able to work and grasp objects, becoming stronger and more useful. Both active and passive motion much restricted, whole range of motion about 45 degrees.*

* The X-rays published with this case show an unusual and interesting complication which apparently was not noticed by Hessler. Besides the lesions of which he speaks, there is also a fracture of the os magnum through its neck with partial rotation of the head. The presence of this fragment may account for the rather unsatisfactory result.

DUBAR (cf. POTEL).—Male; seventeen years. Diagnosis not made at first. Put in splints. Movements of left wrist very limited, pain on pressure, motion 30 degrees. *X-ray Diagnosis*, anterior dislocation of the scaphoid and semilunar. *Operation* six months after injury. Both bones excised. Splints, passive motion fifteen days after operation. Two months later very good active and passive motion in flexion and extension without pain. Termined an excellent result.

RIEHOE.—Male; January 15, 1902. Multiple injuries with cerebral symptoms caused wrist lesion to be overlooked for thirteen days. Tumor on anterior surface of right wrist with nearly complete ankylosis. *Diagnosis* was fracture of the lower end of the radius. X-ray showed fracture of the scaphoid with an anterior dislocation of its proximal fragment with the semilunar. Nearly complete ankylosis, atrophy of muscles of hand and forearm. Reduction tried without success. *Operation*, February 18, 1902. Palmar incision seven to eight centimetres, dissection opening the wrist-joint; attempted reduction was not successful. Semilunar and proximal fragment of scaphoid excised; wound closed with catgut. Splint. March 31, 1902, with mobilization and massage nearly seven weeks, movements increased to 140 degrees, but painful. Treated with static electricity. April 22, 1902, flexion nearly normal, extension extremely limited. Treatment continued until June 25, 1902, then hand was less red and less œdematous. August 4, 1902, less atrophy and more strength in hand and forearm, flexion and extension as on April 22.

STIMSON.—Male; twenty-six years. Left wrist. Tenderness and crepitus over scaphoid. Ether manipulation two weeks after injury gave crepitus, and a mass was felt below the outer half of the anterior border of the carpus. *Operation*, proximal portion of fractured scaphoid could be replaced, but the fractured surfaces could not be put in good apposition. Fragment separated from the semilunar and excised. Result, range of motion still restricted, and an abnormal prominence felt just above the radiocarpal line.*

QUERVAIN.—Male; twenty-four years; June, 1901. *Diagnosis*, fracture of scaphoid and anterior dislocation of semilunar. Both wrists held in flexion; attempted reduction gave sensation of crepitus. July 11, 1901, both wrists show diffuse swelling and silver-fork deformity. Motion of right wrist, passive extension 15 degrees, no active flexion or extension, no abduction, no adduction, free pronation and supination. Less passive motion on left than right. X-ray showed left wrist oblique fracture of scaphoid with proximal fragment covered by shadow of semilunar in palmar view. Right wrist showed in palmar view a fracture of the scaphoid in three parts, anterior luxation of semilunar and dorsal disloca-

* The X-ray lateral view shows not only the dislocation of the proximal half of the scaphoid, but an anterior dislocation of the semilunar with the concavity forward. As Stimson remarked, the limitation of motion is probably due to "uncorrected derangement of the relations of the remaining bones;" in this case apparently the semilunar had been dislocated and was not reduced. This is evident from the X-ray published with the case.

tion of head of os magnum. Advised to have operation on left, and later, if successful, on the right.

July 16, 1901. *Operation* on the left hand. Ether. Dorsal incision, wrist-joint opened, and proximal fragment of scaphoid removed, having an oblique fractured surface. The ligaments attached to the semilunar were entirely torn and the bone dislocated forward. Replaced and sutured to strips of capsule. This would not hold it in place, and the bone was excised. Wound drained with glass tube and sutured. Tube removed the second day, and suture the eighth. High position and bandage. Active and passive motion after fourteen days.

August 13. Left hand has passive motion quite free in all directions. Active motion still limited. Appearance normal. Right hand, silver-fork deformity still exists, and no improvement in motions.

Operation on the right hand. Ether. Dorsal incision. Scaphoid seen in three pieces, two large and one small. No callous formation. The proximal large fragment, dislocated forward, was removed; also the middle small fragment, which was dislocated dorsally. Semilunar found in anterior dislocation, concavity towards radius; excised, and motions of wrist became free. Capsule closed with two sutures,—drainage and skin suture. Splint in extension and high position. Drain removed the second day. Active and passive motion after fourteen days. In October the patient began to work.

November, test of grip; right, 20 kilogrammes; left, 25 kilogrammes, dynameter.

December, test of grip; right, 25-30 kilogrammes; left, 22-23 kilogrammes.

Motions. Right: Passive add. and abd., 25° to 30°; active, 15° to 20°.

Passive extension, 30° active, 25°.

Passive flexion, 30° active, 25°.

Left: Passive add. and abd., 35° active, 20° to 25°.

Passive extension, — active, 25°.

Passive flexion, — active, 30°.

Pronation and supination free. Appearance of wrist is normal. The patient is able to do all work where no special strength is needed.

OBERST, reported by Sulzberger.—Male; aged twenty-five years. Injury to right wrist; bandage for five weeks; removed February 25. No motion of fingers. March 8, right wrist held in flexion and adduction; increase of circumference. Distance from tip of right radial styloid to distal end of first metacarpal is one centimetre shorter than on left hand. The distance from tip of right ulna styloid to distal end of fifth metacarpal is one centimetre shorter than on left hand. *Diagnosis*, luxation of intercarpal row made before and after X-ray. *Treatment*, massage and exercise. Discharged April 29. Result, prominence of carpus, increased circumference of right wrist. Still flexed and adducted. Flexion within one-fourth of normal. No extension. Shortening as by previous measurements, one centimetre. Can close fingers and fist. Atrophy of forearm. No change in strength of muscles.

OBERST, reported by Sulzberger.—Male; aged fifty-five years; miner. November 6, 1900. *Early diagnosis*, severe lesion of carpal bones. Plaster bandage fourteen days, then massage. Entered hospital in December, 1900. Left wrist held in adduction, hand shortened and broadened, in-

crease in circumference. Distance from tip of left radial styloid to distal end of first metacarpal, three-quarters of a centimetre less on left than on right hand. Distance from tip of ulna styloid to distal end of fifth metacarpal three-quarters of a centimetre less on the left. Articulation entirely stiff, muscles weakened, tenderness not marked. *X-ray diagnosis*, dorsal dislocation of distal carpal row, osteoporosis. *Treatment*, massage and exercise. Slow improvement. Discharged in February, 1901. Left wrist admits only slight passive movement, hand not perfectly closed, power of grasp very poor. Left hand one centimetre shorter than the right.

CASES OF ANTERIOR DISLOCATION OF SEMILUNAR BONE.

GAMGEE.—Male; aged fifty-two years. *Diagnosis*, anterior dislocation of left semilunar. No motion in flexion possible. Manipulation failed to reduce the bone. Pressure on median nerve. *Operation*, four months after injury; excision. Result, perfect movement of wrist.

AUBAN.—Male. Tumor on anterior surface of wrist with œdema of wrist and forearm. Original diagnosis, fracture of lower end of radius, attempted reduction not successful. *X-ray diagnosis*, anterior luxation of semilunar. *Operation*, excision. Good result in flexion and extension.

DELBERT.—Case of Dentu.—Male; aged twenty-six years. *Diagnosis*, anterior dislocation of right semilunar, restriction of motion of wrist. *Operation* four months later; semilunar excised. Result, recovery of nearly the whole movement of the wrist-joint.

URBAN.—Male. Injury, September 3, 1900. Splints three week. Condition, swelling and increase of circumference two centimetres. Wrist held in slight extension. Tumor on anterior surface of wrist. *Diagnosis*, anterior dislocation of semilunar. *Operation* refused. Later came to operation March 28, 1902. Schleich, infiltration and excision of semilunar through palmar longitudinal incision. Immediately flexion of wrist was restored, wound closed.

Result: Flexion, 60 degrees. Normal for other hand being 87 degrees.

Extension, 70 degrees. Normal for other hand being 86 degrees.

Abduction, 15 degrees. Normal for other hand being 27 degrees.

Adduction, 25 degrees.

POTEL.—Boy; aged nineteen years. *Diagnosis*, anterior dislocation of semilunar. *Operation*, six months after injury; excision of semilunar. Result one month after operation, motion of wrist nearly normal. Not seen since.

BERGER.—Male; aged thirty-four years. *Diagnosis*, anterior luxation of semilunar. Restriction of motion. *Operation*, one year after injury; excision of semilunar. Reported as good result.

FOLLET.—Male; aged nineteen years. *Diagnosis*, fracture of radius; impossible to reduce. Operation showed anterior dislocation of semilunar, which was excised. Result, nearly normal movements of wrist.

ELY.—Male; aged twenty-five years. Right wrist swollen. All motions painful. *Diagnosis*, Colles fracture. The patient was given ether

for reduction, at which time crepitus was felt, and manipulation showed that the scaphoid could be dislocated onto the dorsum. X-ray showed a tipping forward of the scaphoid but no positive fracture, though crepitus was felt in the region of the scaphoid. Anterior and posterior splints were applied. At the end of three weeks, adhesive tape was worn for two weeks. The result is recorded as "good degree of motion in all directions."*

HOFLIGER.—Male; aged eighteen years. *Diagnosis*, anterior luxation of semilunar. November, 1899. Condition, August, 1900, very slight extension, flexion about 45 degrees, no supination. *Operation*, August, 1900, Dr. Kaufman. Excision of semilunar through palmar incision. Wound drained. Result in October described as "good."

SULZBERGER.—April 18; aged thirty-three years. Left wrist swollen, held in adduction. Increased circumference. Distance from tip of radial styloid to distal end of first metacarpal six centimetres less on left than on right hand. Palm shortened and broadened. *Diagnosis*, both before and after X-ray, anterior dislocation of semilunar. Anæsthesia, manipulation by hyperextension, traction, pressure on the dislocated bone, and gradual motion from position of extension to one of flexion. Reduction resulted. Splints ten days, then massage. June 9, same year, discharged with useful wrist. Movements entirely free, with small limitation of extension; wrist a little thickened. X-ray shows normal relations of the bones.

CONCLUSION.

It has been the intention of the authors in this paper to draw the attention of surgeons to more systematic observation, and to more exact methods of diagnosis and treatment of carpal injuries than is shown to exist by the present literature of the subject. We realize that in individual instances many of the authors whose opinions or whose cases we have quoted have been able to interpret and successfully treat similar cases to those which we publish, but from our own observations and experience we know that many other such cases are not understood, and hence are not successfully treated. Undoubtedly such cases here and there have been recognized and properly handled, especially since the X-ray has been in gen-

*The reproduction of the lateral view of the wrist accompanying the article, though not as clear as one would wish, certainly looks to the authors like an anterior dislocation of the semilunar bone with its concave surface directed towards the palmar side, the presence of which would account for much, if not all, of the limitation of motion in this case. We doubt the dislocation of the scaphoid "on the dorsum."

eral use; but we believe that the profession at large does not realize that many obstinate sprained wrists are instances of fracture or dislocation of the carpal bones, and that the treatment of such injuries should be known as definitely as those of fracture or dislocation of any other joint. The conclusions which we have come to in our study of this subject have been founded on our own observations on the cases we have seen and treated, and though in reviewing the literature we have found attention called to many of the points which we have noted ourselves, we have nowhere found the whole field covered.

We feel that the results obtained in our operated Cases 8, 9, 10, 11, 16, 17 justify our recommending a somewhat radical treatment, because the cases which have been treated conservatively have neither recovered so quickly nor so completely as those on which we have operated. Nevertheless, we realize that it is a delicate question to decide whether the risk of sepsis would overbalance the prospect of gain in functional usefulness.

We desire to summarize the important points in our paper as follows:

1. "Sprains" of the wrist which do not promptly recover are in many cases fractures or dislocations of the carpal bones.
2. The large majority of such carpal injuries are either simple fractures of the scaphoid or anterior dislocations of the semilunar bone.
3. These two injuries are frequently combined, and in such cases the proximal fragment of the scaphoid is usually dislocated forward with the semilunar.
4. Simple fracture of the scaphoid gives a definite clinical picture, and may be recognized even without the X-ray by the association of the following symptoms, viz. (*a*) The history of a fall on the extended hand; (*b*) localized swelling in the radial half of the wrist-joint; (*c*) acute tenderness in the anatomical snuff-box when the hand is adducted; (*d*) limitation of extension by muscular spasm, the overcoming of which by force causes unbearable pain.

5. A broken scaphoid has little power of repair and appears capable of but slight callous formation.

6. Fractures of the scaphoid which remain untreated or are treated by massage and active and passive motion, generally, if not always, remain ununited, and the original symptoms often persist for years with only slightly abated intensity.

7. Cases of fracture of the scaphoid may unite if motion of the wrist is prevented during the first four weeks after the injury, but if by this time no union has occurred, future union is unlikely.

8. Excision of the proximal half of a fractured scaphoid gives a somewhat better result than conservative treatment.

9. A posterior incision to the outer side of the tendons of the extensor communis digitorum gives an easy and safe access to the proximal half of the scaphoid.

10. Passive motion of the wrist-joint and active motion of the fingers should be begun within a week after this operation.

11. The possibility of the existence of a bipartite scaphoid should be considered in interpreting X-rays of simple fracture of the scaphoid, but its occurrence must be very rare in comparison with fracture.

12. Anterior dislocation of the semilunar bone should be recognized clinically, even without the X-ray, by the association of the following symptoms, viz. (a) The history of an injury of considerable violence to the extended or twisted wrist; (b) a silver-fork deformity, the posterior prominence of which corresponds with the head of the os magnum, and between which and the lower end of the radius is found a groove representing the position formerly occupied by the now anteriorly dislocated semilunar; (c) a tumor under the flexor tendons of the wrist just anterior to the lower end of the radius; (d) a shortened appearance of the palm as compared to the other hand; (e) stiffness of the partially flexed fingers, motion of which, either active or passive, is painful; (f) the persistence of the normal relation of the styloid processes of the ulna and radius and the existence of shortening of the

distance from the radial styloid to the base of the first metacarpal.

13. Recent dislocations of the semilunar may be reduced with good result even after the fifth week by hyperextension followed by hyperflexion over the thumbs of an assistant held firmly in the flexure of the wrist on the semilunar.

14. Irreducible dislocations demand excision of the semilunar and the whole or a portion of the scaphoid if there is a coincident fracture of the latter.

BIBLIOGRAPHY.

- Abadie. Bull. Méd., Paris, 1903, xvii, 993.
- Abadie et Gagniere. Montpel. Méd., 1902, N. S., xiv, 310-315.
- Abbott. Boston Medical and Surgical Journal, Vol. cxl, 1899, p. 422.
- Albertin. La Province Méd., Nr. 27, 1887. Lyon Méd., 1894-95, xxxiv, p. 160.
- Alquié. Rev. théér. du Midi, 4, 1851.
- Anderson. Journal of Anatomy and Physiology, London, 1882-3, xvii, p. 253.
- Apelt. Monatsehr. für Unfallheilk., Leipzig, 1903, x, 213.
- Auban. Arch. de Méd. et Pharm. Mil, Paris, 1903, xlii, 254.
- Bardenheuer. Deutsche Chirurgie, Luf. 63, B, p. 391, 1888.
- Barois. Arch. de Méd. Milit., Band xviii, p. 55, 1891.
- Beck. Fractures, 1900. Röntgen Rays, Diagnosis and Therapy, 1904, pp. 229, 230.
- Behrendsen. Deutsche med. Wochenschr., 1897, No. 27.
- Berger. Bull. et Mém. Soc. de Chir. de Paris, 1897, N. S. xxiii, 763, and 1899, Tome xxv, 717.
- Bieberbach. Über Verrenk. der Handwurzelknochen, Dessert, Jena, 1877.
- Blau. Deut. Zeit. f. Chirurgie, Band lxxii, 1904, p. 445.
- Bolton. ANNALS OF SURGERY, 1901, Vol. xxxiv.
- Bonner. Gaz. de Hôp., 1864, p. 487.
- Bork. Proceedings of the St. Louis Medical Society, Missouri (1880), 1881, iii, 79. Reprint in St. Louis Medical and Surgical Journal, 1880, xxxviii, 272.
- Bouchet. Thèse de Paris, Juillet, 1834.
- Boyer. Leçons de C. Boyer, Paris, 1803, Tome ii, 125.
- Buchanan. Medical Times and Gazette, London, 1885, i, 113. Medical and Surgical Reporter, Philadelphia, 1882, xli, 418.
- Cameron. Lancet, Vol. xvii, i, p. 885, 1884.
- Chisolm. Philadelphia Medical Times, i, 18, June, 1871. Lancet 28, x, 1871, ii, p. 665.
- Chuffart. Lille, Imp. H. Moul., 1902, 8vo, No. 97, p. 88.
- Codman. Journal of Experimental Medicine, Vol. iii, No. 3, 1898. Boston Medical and Surgical Journal, Vol. cl, No. 14, pp. 371-374, April 7, 1904.

- Cooper. On Dislocations and Fractures of the Joints, New Ed., London, 1842, p. 501.
- Cousins. Thèse Lyon, 1897.
- Crawford. *Lancet*, January, 1899, p. 90.
- Cros. *Rev. Méd. de l'Afrique du Nord Alger*, 1903, vi, 2143.
- Debierre. *Jour. de l'Anat. et de la Physiol.*, Vol. xxii, 1886, p. 285.
- Delbert. *Bull. et Mém. Soc. Anat. de Paris*, 1903, lxxviii, 590.
- Destot. *Bull. Soc. de Chir. de Lyon*, 1902, 3, vi, 7; 22. *Lyon Méd.*, 1898, lxxxvii, p. 20. *Lyon Méd.*, 1904, cii, 106-110, 373, 529; *Lyon Méd.*, 1904, ciii, 315, 402.
- Dubar. *La Presse Médical*, 1899, i, p. 28, Paris.
- Dujon. *Centre Méd. et Pharm. Commentry*, 1900, vi, 12.
- Dwight. *Anatomischer Anzeiger*, xxiv, Band ix, 1903. *Boston Medical and Surgical Journal*, Vol. cxlix, 1903, No. 5, p. 119.
- Eigenbrodt. *Beit. z. klin. Chir.*, Tübingen, 1901, xxx, 805.
- Ely. *ANNALS OF SURGERY*, Philadelphia, July, 1903, p. 97.
- Erichsen. *Prakt. Handb. der Chir.*, Uebers von Thammhayn, 1864, Band i, p. 285. *Science and Art of Surgery*, 1860, p. 258.
- Payne. *Revue de Thérapeutique*, March, 1887.
- Fergusson. *System of Practical Surgery*, Amer. Ed., 1853, p. 209.
- Flower. *Hulke in T. Holmes, A System of Surgery*, London, ii, p. 585, 1861; Third Edition, London, 1883.
- Folet. *Presse Méd.*, 18 Janv., 1899, p. 28.
- Forgue. *Gaz. hebdom. de Montpellier*, Nr. i, 1887.
- Fortuinet. *Traité de Chirurgie de MM. le Dentu et Delbet*, *Lyon Méd.*, July, 1888.
- Fourrier. *Arch. Méd. belges*, Brux., 1898, 4, S. xii, 361.
- Frederick. *Handbuch der praktischen Chirurgie*, ii, Aufl. Lig. II, 1903, p. 323.
- Friedreich. *Von Bergmann's System of Practical Surgery*, Vol. iii, p. 303.
- Gallois. Thèse Lyon, 1898.
- Gallony. Paris, 1901-02, 8vo, No. 568, p. 64.
- Gamgee. *Lancet*, 1895, ii, p. 31.
- Gay. *Boston Medical and Surgical Journal*, 1869, p. 188.
- Gegenbauer. *Lehrbuch der Anatomie*, 1883, Band iii, 193.
- Gras. *Gaz. Méd. de Paris*, No. 34, 1835, p. 542.
- Gross. *Arch. f. klinik Chir.*, Berl., 1903, lxx, 793. *Philadelphia Medical Times*, 1881, xii, p. 220.
- Groves. *Lancet*, London, August 13, 1904.
- Gruber. *Virehow's Archiv*, 94 u. 98, Band, S. 345 u. 397.
- Guibot. *Bull. de la Soc. Anat.*, Janv., 1847, Tome xxii, 27.
- Grünwald. *Monatschr. für Unfallheilk.*, 1899, vi, p. 142.
- Hamilton. *Fraetures and Dislocations*, 1875. *Gaz. des Hôp.*, 1841, p. 436.
- Haughton and Holt. *J. Roy. Army Med. Corps*, Lond., 1904, iii, 282.
- Hémery. Lille, Imp. le Bigot, frères, 1902, 8vo, No. 84, p. 48.
- Hessert. *ANNALS OF SURGERY*, Philadelphia, March, 1903, xxxvii, p. 402.
- Hodges. *Boston Medical and Surgical Journal*, 1866, p. 261.
- Hoffiger. *Corresp. Blt. f. Schweizer Aerzte*, Basle Zeitschr., 1901, S. 297 and 338.

- Hönigschmied. *Deutsche Zeitschrift für Chirurgie*, 1878, Band x, p. 462.
 Hunt. *Annals of Anatomy and Surgery*, 1881, p. 110.
 Hurry and Cerné. *Normandie méd.*, Rouen, 1904, xix, 41.
 Hüter. *Klinik der Gelenkkrankheiten*, Band ii, p. 763, 1. Aufl., 1871.
 Jaboulay. *Bull. Soc. de Chir. de Lyon*, 1902, Vol. lxxxvi, p. 436.
 Janjavay. *Thèses de Paris*, 1846, p. 25.
 Kaufman. *Korrespondenz Blatt. f. Schweizer (Basle)*, May and June, No. 9, 1902, p. 258.
 Koenig. *Spec. Chir.*, 7, Aufl. iii, p. 345, 1900.
 Kohler. *Korrespondenz Blatt f. Schweizer Aerzte*, 1902, No. 9, p. 261.
 Körte. *Deutsche med. Wochenschr.*, 1898, Band v.
 Lauenstein. *Fortschritte a. d. Gebiete der Röntgenstrahlen*, Band ii, S. 218, 1898-9.
 Leboucq. *Archiv. de Biol.*, Band v, S. 49.
 Lembke. *Archiv f. Unfallheilkunde*, Band iii, p. 39, 1899.
 Leriche. *Journ. de Chir. et Ann. Soc. belge de Chir.*, Brux., 1902, ii, 7 and 8, p. 159.
 Lesser. *Deutsche Zeitschrift f. Chirurgie*, Berlin, lxvii, p. 491.
 Letenneur. *Bull. de la Soc. Anatomique*, Vol. xiv, 162, August, 1839.
 Lilienfeld. *Archiv f. klin. Chirurgie*, Langenbeck's, Berlin, 1903, Vol. lxi, p. 1158.
 Lilienfeld. *München. med. Wchnschr.*, 1904, li, 234.
 Malgaigne. *Traité des Fract. et des Lux.*, Tome ii, 1855, p. 718.
 Morris. *New York Medical Record*, Band xxiii, p. 376, 1883.
 Morton. *British Medical Journal*, London, 1895, ii, 131.
 Mosengeil. *Archiv für klin. Chir.*, Band xii, p. 723, 1870.
 Mourques. *Bordeaux*, 1902, 8vo, No. 97, p. 75.
 Nancrede. *Proceedings of Philadelphia County Medical Society*, 1880-81, Philadelphia, 1881, iii, 7.
 Oberst. *Fortschritte a. d. Gebiete der Röntgenstr. Erg.*, Heft 5, p. 6.
 O'Hara. *Philadelphia County Medical Society*, 1881-2, Philadelphia, 1882, iv, 55.
 Pagenstecker. *Münch. med. Woch.*, 1903, No. 44.
 Parvis. *Archiv d. Med. Militaire*, Vol. xviii, 1891.
 Pfitzner. *Zeitschrift für Morphologie und Anthropologie*, Schwalbe, ii, 1900, p. 156.
 Pfitzner. *Zeitschrift f. Morph. u. Anthropol.*, Band ii, S. 506.
 Putégnat. *Jour. de Chir.*, p. 305, 1843.
 Quervain. *Montschr. für Unfallheilk.*, 1902, Heft 3.
 Rey. *Bull. Méd. de l'Algérie*, 1903, 2, S. i, p. 31. *Lyon Méd.*, 1903, ci, 347.
 Reynard. *Lyon*, 1904, Schneider, pp. 55, 80.
 Ricard. *Traité de Chirurgie*, Tome ii, 1890, p. 498.
 Richon. *Arch. de Méd. et Pharm. mil.*, Paris, 1903, xli, 248.
 Ross and Wilbert. *Philadelphia Medical Journal*, October, 1900, p. 706.
 Russ. *ANNALS OF SURGERY*, February, 1905, 265.
 Rutherford. *Glasgow Medical Journal*, 1891, p. 311.
 Scudder. (a) *Fractures*, 1900; (b) *Fourth Edition*, 1904.
 cxxi, 85.
 Sheldon. *American Journal of Medical Sciences*, Philadelphia, 1901.

- Smith. *British Medical Journal*, 20, iii, 1880, 1, p. 440.
- Staffel. *Arch. f. klin. Chir.*, Berl., 1901, lxi, 196.
- Stewart. *New York Medical Record*, October 6, 1888, p. 423.
- Stimson. *ANNALS OF SURGERY*, Philadelphia, 1902, xxxv, p. 574. *Practical Treatise on Fractures and Dislocations*, Third Edition, 1900.
- Stokes. *British Medical Journal*, May, 1900.
- Struthers. *Journal of Anatomy and Physiology*, London, 1873-4, viii, 113.
- Sulzberger. *Fortschritte a. d. Gebiete der Röntgenstrahlen*, Band v, Heft 3, 1901-2.
- Taaffe. *British Medical Journal*, i, May, 1869, p. 398.
- Tillman. *Arch. der Heilk.*, xv, p. 287, 1874. *Lehrbuch der speciellen Chirurgie*, 1891.
- Turner. *Journal of Anatomy and Physiology*, London, 1882-3, xvii, p. 244.
- Uhde. *Deutsche Klinik*, 1850, p. 539.
- Urban. *Wiener med. Wochenschrift*, No. 8, 1903, p. 357.
- Vialle. *Lyon Méd.*, 1904, cii, 315, ciii, 374. *Bull. Soc. de Chir. de Lyon*, 1904, vii, 11.
- Von Berginann, von Bruns, von Mikulicz. *Handbuch der praktischen Chirurgie*, 1901, Band iv, p. 381.
- Von Ranke. *Munchner med. Wochenschr.*, 1898, No. 43.
- Von Wyss. *Fortschritte a. d. Gebiete d. Röntgenstrahlen*, Band iii, S. 57, 58-87.
- Weber. *Chir. Erfahr. und Unters*, Bonn, 1859, p. 233.
- Wendt. *Münch. med. Woch.*, 1904, 1050-1053.
- Wicssner. *Deutsche med. Wochenschr.*, Leipzig, w. Berl., 1901, xx, 323.
- Wilbert. *American Journal*, January 23, 1904.
- Williams. *Röntgen-Rays in Medicine and Surgery*, 1903.
- Wilms. *Fortschritte a. d. Gebiete d. Röntgenstrahlen*, *Erg.*, Heft 9, 1902.
- Woolf. *Deutsche Zeitschrift für Chirurgie*, Band lxx, Hefte 3, 4, October, 1903. *Monatschr. für Unfallheilk.*, Leipzig, 1903, No. 7, 201; No. 8, 233.